Robinson (A. R.)

ON THE

NATURE AND PATHOLOGICAL HISTOLOGY

OF

PSORIASIS.

BY

A. R. ROBINSON, M. B., L. R. C. P. & S., EDIN.,

SPECIAL PATHOLOGIST TO THE NEW YORK CITY ASYLUM FOR THE INSANE; ATTENDING PHYSICIAN TO THE BELLEVUE BUREAU OF OUT-DOOR POOR, CHILDREN'S DEPARTMENT; MEMBER OF THE NEW YORK COUNTY MEDICAL SOCIETY, OF THE NEW YORK DERMATOLOGICAL SOCIETY, ETC.

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ON THE NATURE AND PATHOLOGICAL HISTOLOGY OF PSORIASIS.

As the views which I have formed of the nature and pathological histology of psoriasis, after careful microscopical observation of a large number of psoriatic portions of skin, differ from those which have been enunciated by other observers of this affection, I propose in the present paper to describe in detail all the changes which have been observed by me as taking place in the skin in the different forms and stages of this disease.

The special views which I will give as to the nature of the disease are views which have been forced upon me by repeated microscopical study of the disease in its early stage; and although the solution of this question was attended with considerable difficulty, and required not a little time, yet I feel convinced that they are based upon correct observation of the comparative order of change in the different tissues of the skin at the seat of the eruption, and are now published in the conviction that thereby I will contribute to our present knowledge of the nature and pathological histology of psoriasis.

In order that the reader can follow easily and intelligently the description of the various changes which take place in the different stages[1] of the disease, or rather, in the different forms and conditions presented by the eruption at different periods, and thus be enabled to have a distinct idea of the pathological anatomy of any patch of eruption when viewing it with the naked eye, it is necessary to glance briefly at the clinical characters of the disease. With the exception of this condensed account of the symptoms of psoriasis, and an account of the views of Simon, Wertheim, Rindfleisch, and Neumann, on its nature, I will not trespass upon the time of the reader with compilation, but will confine myself strictly to a description of what I have observed, to the conclusions which have been formed therefrom, and to a defense of those conclusions.

Definition: Psoriasis is a chronic disease of the skin, characterized by elevated, reddish, dry patches of variable size and shape, which are covered by whitish mother-of-pearl-like scales, more or less closely united together.

Symptoms: Psoriasis commences as small, reddish, elevated spots which spread peripherically, producing patches of variable size and shape. On account of the difference in the size and form of the different patches, the disease has been divided into several varieties. When the spots are about the size of a pin-head or less, it is called psoriasis punctata. This is the form the eruption first assumes. If the patches are larger and resemble somewhat drops of mortar, it is called psoriasis guttata. If they are about the size of a twenty-five cent piece, it is called psoriasis nummularis; and if they cover a large extent of surface, psoriasis diffusa. If the patches heal at the centre and increase at the periphery, it is called psoriasis orbicularis; and, if neighboring rings meet and form bands, it is called psoriasis gyrata.

These divisions are, however, superfluous, as the nature of the disease remains the same, whatever form the eruption may assume.

[1] I make use of the term "stage of the disease," to represent periods of existence of the eruption, for the sake of convenience; the eruption in psoriasis being in reality not divisible into stages.

Soon after the appearance of the disease as a small, reddish, papular elevation, whitish scales begin to appear on the summit of the papule, and increase in quantity as long as the disease is actively increasing in extent. The scales are seated upon a hyperæmic base, they are easily detached with the finger nail, and their removal, together with a few underlying epithelial cells of the Malpighian layer, is followed by the appearance upon the papule of oozing or bleeding points. The amount of scaling varies in different persons, in the different patches of the eruption in the same person, and in a single patch according to the period of existence, and to the condition of the eruption. More scales are present on a given area, when the disease has lasted a certain period and is still actively progressing, than at the commencement of the eruption, or during the period of disappearance. Sometimes, especially on stationary chronic patches, situated on the front part of the foreleg (and occasionally on other parts of the body), the amount of scales formed varies but little within a lengthened period of existence. The amount of scaling diminishes when the normal nutrition of the skin is interfered with, either from general mal-nutrition, or from an acute febrile disease. Generally fewer scales are formed in females than in males, and on patches seated on the flexor surfaces of the body than on the extensor surfaces. Fewer scales are also formed in very young persons than in those of mature age. In short, where the epidermic layer of the skin is thin, the scales are less in quantity than where this layer is more strongly developed.

The whitish appearance presented by the scales is due to the presence of air in the spaces between the shriveled and dried-up epithelial cells.

In the active period of the eruption more especially, scraping or scratching the surface of the patches sufficiently to remove the epithelial cells seated over the apex of the papillæ is followed by the escape of more or less blood from the blood-vessels of the underlying papillæ. Sometimes there is only an oozing out of a very small quantity, in other cases actual bleeding may occur and continue several minutes, causing the loss of several drachms of blood. As the eruption retro-

grades, the amount of blood which escapes after scraping or scratching gradually decreases, until finally the affected part acts in this respect the same as healthy skin.

In uncomplicated cases of psoriasis, there is never any vesiculation, pustulation, or discharge of any kind. When a patch of eruption has existed some time, there is more or less infiltration of the skin and diminution in the elasticity of the affected part. On account of this thickening and diminution of elasticity of the skin, the surface of the affected part may become cracked and fissured, and secondary processes, as eczema, etc., may arise and complicate the primary eruption. This fact is of value when considering the existence of any relation between eczema and psoriasis. After the disappearance of the eruption in psoriasis, dark pigmented spots, corresponding in size and location to the seat of the eruption, are generally seen. The colored spots continue a greater or less period of time, and are finally replaced by normal skin. Very rarely is the pigmentation permanent. In one of my patients, white spots instead of dark ones followed the eruption, and remained several weeks before being replaced by normally colored skin. The favorite seats for the development of psoriasis are the elbows, knees, and flexor surfaces of the body; though it may appear on any part of the skin. It is very rarely met with under the age of puberty, and is very frequently hereditary.

There are other points in the clinical history of this eruption, but the above condensed description is sufficient for the purposes of the present paper, which, as I have already said, is specially intended to discuss the nature and pathological histology of the disease.

Nature and Pathological Histology: Gustave Simon[1] considered that the red spots which precede the production of the scales arise probably in consequence of a chronic inflammatory process, and that, if this supposition is correct, the swelling of these spots depends upon the accumulation of inflammatory products. The condition of chronic inflamma-

[1] "Die Hautkrankheiten, durch anatomische Untersuchungen erläutert." Berlin, 1851, p. 212.

tion of the skin present in psoriasis he thought has probably a share in the excessive formation of scales, "in that the newly-formed epidermis is continually separated from the cutis by the accumulating exudation beneath it. That part of the epidermis still closely united with the cutis is thinner than in the normal condition, that is, it is in a condition of atrophy." Simon considered that it is incorrect to regard psoriasis as an hypertrophy of the epidermis, "because the scales which make up the thickening consist of dead epidermis, which is no longer nourished, and is only loosely connected with the skin."

Wertheim examined portions of affected skin taken from four individuals, and "found the papillæ, both in their horizontal and perpendicular diameter, enlarged 12 to 15 times their normal size. The blood-vessels of the papillæ appeared as if the enlarged blood-vessel was much curved and bent in its course to the apex of the papilla, in such a manner that it seemed to completely fill up the stroma of the latter." From this enlargement of the papillæ and the above described changes in the blood-vessels, he considered that there arises an obstruction to the circulation, which produces the sharply-contoured psoriasis patches. Wertheim's view of the nature of the disease, therefore, was that it arises from changes which take place in the blood-vessels of a circumscribed region.

Neumann[1] has studied the histology of the disease by the aid of the microscope more than any previous observer had done, he having made sections from both recent and old psoriasis patches. "He found the rete Malpighii and the epidermis greatly developed, and the papillæ, especially in the older patches, enlarged. The corium as well as the papillæ filled with numerous cell-growths. These appear in large numbers, especially along the course of the blood-vessels; they are, however, also found isolated and show numerous prolongations. They appear especially in the upper layers of the corium and in the apex of the papillæ, where they collect in a cluster. If we follow a large vessel of the corium and

[1] "Lehrbuch der Hautkrankheiten," Wien, 1870, p. 201.

the branches which pass from it into the papillæ, one finds, besides the already mentioned excessive cell productions which gather around the wall of the blood-vessels, that the small branches which run into the papillæ spread themselves in a straight line the entire length of the papillæ, and in some, the vessel in the apex is seen to be many times bent; in such a manner that the cells lying upon the wall of the vessel, and which previously had a similar direction, now lie horizontally or obliquely. A transverse section through the papillæ shows the cell collection filling up almost the entire stroma of the papillæ. They form a circle, in the centre of which is a blood-vessel."

From these observations, Neumann concludes that psoriasis is an inflammatory disease of the papillæ, and of the upper layer of the corium, which is accompanied by marked excessive cell-production, which causes enlargement of the papillæ. The excessive production of epidermis he regards as only a hyperplasia of the cells of the Malpighian layer, which is accompanied by an increased desquamation of the epidermic layer.

According to Rindfleisch,[1] the squamous exanthem takes its origin in an inflammation of circumscribed spots of the skin. These are reddened, slightly swollen, and endowed with other attributes of an inflammatory hyperæmia; and as a consequence of the hyperæmia, there appears, not an exudation in or under the epidermis, but only an abundant formation of otherwise normal epidermic cells. Why the cells in psoriasis are collected in heaps instead of being gradually desquamated is, in his opinion, because the cells do not undergo the whole process of change which occurs in normal epidermic cells. He finds the condition reached by them to be that corresponding to the condition of development present in the transition cells lying between the cylindrical cells of the mucous layer and the lowest cells of the horny layer. Instead, therefore, of becoming horny, there occurs simply a drying up of the soft protoplasm. In this drying up, the cells are naturally stuck together, and thus maintain mechanical

[1] "Lehrbuch der pathologische Gewebelehre," Leipzig, 1873, p. 259.

connection with the body. According to this observer, an increase of the normal production can only take place under a corresponding increase of the nutritive processes in the papillary bodies. The same process, therefore, which produces epithelial cells increases the normal nutrition of the connective tissue in the papillary bodies, and produces a hypertrophy of this region. He regards psoriasis, therefore, as an inflammatory hypertrophy, and denies to the cells of the Malpighian layer the power of primary independent action.

Views differing from the above have been expressed by other writers; but, as they were not based upon independent microscopical observation, no credit can be accorded to them, even should they prove to be correct. On this account I do not quote their views.

In discussing the pathological histology and nature of this disease, I will describe the changes which I have observed as taking place in the different periods of existence of the eruption, and in its different forms. To attain the object of the paper, more space will be devoted to a description of the changes which have been observed in the affected skin in the earlier periods of the eruption, as it is only by careful study of the changes occurring during the earliest period of recognition with the naked eye that we can hope to arrive at any safe conclusion as to the real nature of the disease.

The question as to the tissue primarily affected, and the nature of the changes which occur, being discussed and settled, as far as possible, the study of the succeeding changes is rendered less difficult, in that we are enabled to separate the essential from the accidental histological changes which occur in psoriasis as well as in many other skin diseases. By essential changes are meant those changes which invariably form a part of the disease itself; and by secondary changes, those which are not constant, and depend for their occurrence upon certain conditions of the general system or of the part affected, or depend upon external agencies.

Commencing, then, with the study of the disease as it presents itself in the earliest and simplest form in which it is recognized, viz., a small papule (psoriasis punctata), smaller

than a pin's head, somewhat elevated above the general surface, reddish in color, having but very few, if any, shining, pearl-like scales upon its summit, and afterward observing the changes which subsequently occur in such a papule in its different periods of existence until it finally disappears, we will probably arrive at correct conclusions as to the nature and pathological histology of this affection. We must study not only the condition present in psoriasis punctata, but also that in psoriasis guttata, psoriasis nummularis, psoriasis gyrata, and also those cases where infiltration is present or absent; in short, in all the conditions under which psoriasis presents itself to our observation. Especially is it necessary that healthy tissue from the immediate neighborhood of the eruption be examined, in order to enable one to compare the normal with the abnormal skin, and to detect variations in structure, which otherwise could not be recognized with positiveness; as in such a varying tissue as the skin the normal condition of a certain part would be unknown. I refer, especially, to variations in the size of the papillæ, and of the Malpighian layer, two structures which differ so much in size in different persons, and on different parts of the body of the same person. A recognition of this fact will convince any one of the necessity of always comparing, if possible, the physiological with the pathological tissue, if a correct idea is to be formed of the amount and nature of the changes which occur in many skin diseases, and especially in psoriasis.

In removing pieces of skin for microscopical study, I have nearly always removed a portion of healthy tissue along with the affected part; and in studying the changes which take place in the different stages of the eruption, I have endeavored to do so by examining what were primarily similar forms of eruption on a single individual, at different periods from their commencement to their disappearance. For instance, a person has an outbreak of psoriasis punctata; I would remove some papules, along with the normal skin surrounding them. Afterward, when the eruption became a psoriasis guttata, portions of affected and normal skin would be removed, and so on throughout the whole course of the disease. In one case I removed a pigmented portion of skin three weeks after

complete disappearance of all elevation above the surface and of whitish scales. This portion was removed from a spot not more than half an inch distant from the seat of two papules which I had removed when each of them was not larger than a pin's head. I studied the disease in this manner in several persons, and obtained therefrom more satisfactory results than by removing only one portion of skin from a single individual.

All the pieces of skin removed were first placed in Miller's liquid, then in dilute alcohol, and finally in absolute alcohol, previous to making sections. The treatment of the sections differed in no respect from that usually followed in histological research on such tissues.

The appearance presented by a section of a papule of a few days' existence, when viewed with a low power, is given in Fig. 1. This papule was removed from the back, near the

FIG. 1.× 75.

inferior angle of the scapula, from a boy eight years of age. The papule was about the size of a small pin's head, and whitish scales were only commencing to form upon its apex. Healthy tissue is present on both sides of the section, externally from *b* on the left side of the drawing, and from *c* on the right side. The piece of skin became somewhat curved during the process of hardening, and as a consequence, the elevation of the affected part above the normal tissue is not seen in the section drawn. Examining such a section with the aid of a low power, a marked difference is seen between the normal and abnormal tissue. Commencing with the corneous

layer of the epidermis, there is scarcely any difference to be observed in the thickness of this layer in the two regions, there being but a very slight increase, if any, in that part corresponding to the seat of the papule. This is the reason why, at the earliest period of the papule formation, so few whitish scales are present. In fact, at the very commencement of the disease they are absent.

The Malpighian layer shows marked variations from the normal condition. While the normal Malpighian layer on both sides of the section in Fig. 1 shows an almost level undersurface, i. e., the papillæ are but very slightly developed; that portion of the layer occupying the centre of the section, and corresponding to the region of the papule, presents more or less deep and broad prolongations downward into the cutis. These prolongations are larger in the central part of the papule than at its margin. As a consequence of this growth downward of the interpapillary portion of the Malpighian layer, there is a larger papillary space in this region than exists in the normal tissue. This apparent increase in the size of the papillæ does not, however, depend upon changes taking place in the normal papillæ, but upon the growth downward of the Malpighian layer. This is readily seen by comparing the healthy with the psoriatic part of the section, and observing that the apices of the papillæ are no nearer the surface in the latter than in the former, while there is a great increase in the thickness of the Malpighian layer in the affected part, especially in its interpapillary portion. This growth inward of a conically-shaped structure, having the apex of the cone downward, produces in proportion to the length of the cones a corresponding increase in the length of the space separating them. This prolongation downward being greater at the centre of a young papule than at the margin, on account of the greater age of the former structure, the long axis of the inter-Malpighian space in the former is greater than in the latter. This is readily seen in Fig. 1, though sections of the papules which contain no hairs show this condition much better.

In the papillæ and superficial part of the corium within the psoriasis region, there are seen enlarged blood-vessels and

round bodies in varying numbers in the surrounding tissue, while in the non-papular region no enlargement of blood-vessels is, as a rule, observed, and also no white blood-corpuscles.

The deeper parts of the cutis appear normal, as well as the sebaceous and sweat glands.

Examining the different structures with a high power, we learn nothing further of changes in the corneous layer than with the low power. There is a slight increase, perhaps, in the thickness of this layer.

With regard to the Malpighian layer, an increase in the size of this structure from increase in the number of the normal epithelial cells is observed. This increase takes place principally in the interpapillary portion of the layer, though also in other parts, and the excessively-produced cells which make up this increase in size differ in no respect from those seen in the normal tissue; unless it be that the newly-formed ones are somewhat smaller, and that those composing the layer next the cutis do not form as regular a cylindrical row as when the cells are not produced so rapidly. Very frequently, however, no difference is to be observed between the cells in the normal and the morbid tissue. The increase in the size of the Malpighian layer arises simply from an increase in the number of cells present in the normal condition, i. e., there is a hyperplasia of this structure. This increase of cells is greatest in the central part of the papule, and least at the margin. In Fig. 2 I have drawn the appearances presented near the centre of a papule a few days old. It will be seen by reference to that figure that there is a great increase in the size of the Malpighian layer throughout its whole extent, and especially in its interpapillary portion. In order to have a correct idea of the amount of increase of this layer in a papule not larger than a pin's head, I have represented, in Fig. 3, surrounding normal tissue, which was removed along with the papule from which the section represented by Fig. 2 was made. Both figures are magnified the same number of diameters.

It is difficult to represent by wood-cuts the form presented by the cells composing the lowest layers of the rete Malpighii

in such a section as is given in Fig. 2. In addition to the usually cylindrical-shaped cells, there is a considerable number of smaller cells which seem to be in the process of growth to

Fig. 2.× 300.

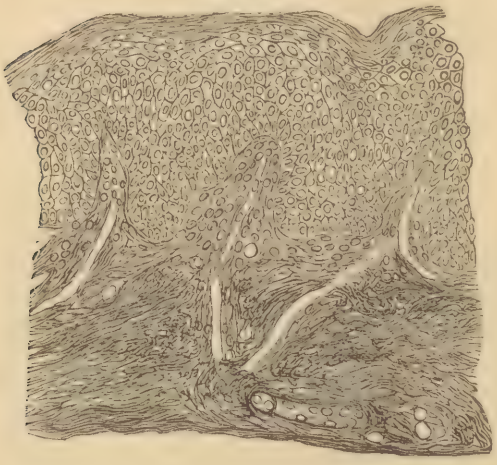
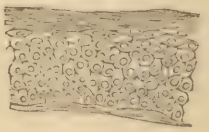


Fig. 3.× 300.

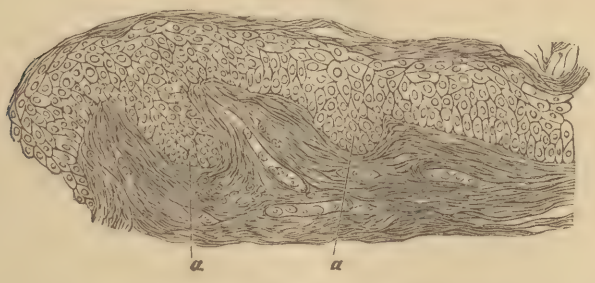


afterward become ordinary epithelial-shaped cells. These cells lie close to the cutis, have a large nucleus in comparison with the surrounding protoplasm or cell body, and are evidently young epithelial cells. A considerable number of the cells forming the lower rows of the Malpighian layer contain two nuclei, generally lying directly opposite each other, and separated only by a narrow line. From the increase in the number of such cells over those met with in normal tissue, and from what we know of the manner of formation of new epithelial cells, I think we are justified in generally regarding those cells containing two nuclei as cells in process of division and multiplication. The result of this division is the small cells I have already described. The cells composing the lowest layers being composed largely, if not entirely, of living matter, can divide much more readily than those cells situated near the corneous layer. From what I have observed in psoriasis during its earliest stage, when there is actual hyperplasia of the Malpighian layer, and before round cells are found outside the blood-vessels, I am led to believe

that all the new cells of this layer are formed from the living matter composing the lower rows of cells of the same layer, and especially from that lying next the cutis. It does not seem to me that any of the Malpighian cells are formed from outwandered white blood-corpuscles at any stage; the absence in the cutis of the latter in the earliest period of the eruption, when there is rapid development of new cells, shows that they do not take any special part in the hyperplasia; and to ascribe to them an active part in the process in the later stages, when the papillæ and cutis contain a large number of them, is to give two separate sources of origin to the cells of the rete Malpighii.

Generally, the nearer the margin of the papule, the less is the hyperplasia of the Malpighian layer, and at the margin itself is to be found the first stage of the hyperplastic process. Fig. 4 represents the margin of a papule, on the right hand

Fig. 4.× 300.



side of which is normal tissue, and on the left pathological. At *a* are seen two prolongations downward. They are separated further from each other, and are more sharply defined, than is usually the case on the margin of a spreading patch of psoriasis. Usually, there is a more gradual shading off of the hyperplastic structure into normal tissue than was present in this case.

By reference to Figs. 1, 2, and 4, it will be seen that in none of them is the Malpighian layer encroached upon by an upward growth of the papillæ. Comparing the thickness of the normal Malpighian layer on both sides of Fig. 1 with the abnormal tissue in the centre, and the right side of Fig. 4 with

the left side, and also Fig. 2 with Fig. 3, it is evident that at no place in the abnormal tissue do the papillæ approach nearer the corneous layer than they do in the normal structure.

As regards the relation which this hyperplasia of the Malpighan layer holds to the development of the papule as seen by the naked eye, I have found by microscopical examination that the hyperplasia precedes the elevation of the papule above the general surface, i. e., that, outside of what appears to the naked eye to be the margin of the papule, there is a spreading hyperplasia of the Malpighian layer. This fact was proven by the following observation, made to settle this and another question which, as will afterward appear, is of considerable importance. Taking care to include, as usual, a sufficient quantity of normal tissue along with the abnormal, I removed two small papules, each about the size of a pin's head, separated by apparently normal tissue, i. e., tissue that was neither hyperæmic nor elevated above the general surface, and treated the excised part in the usual manner, with Miller's liquid and alcohol, previous to making sections for microscopical observation. The papules were separated from each other by a distance not greater than the diameter of one of the papules. On studying sections which included external normal tissue, the two papules, and the apparently normal skin separating the two latter, I found that the papules were much nearer to each other at the base than one would have supposed, judging from the appearance of the intervening skin before excision. Instead of the hyperplastic Malpighian layer of each papule being separated from the other by the diameter of a pin's head, as seemed to be the case with the naked eye, they were not separated by more than one-fifth of that distance. In fact, in one section, it seemed as if they had actually joined each other.

To this general hyperplasia of the Malpighian layer which we have been discussing, is partly due the elevation of the papule above the general surface, principally, however, to the hyperæmia and cutis infiltration which sooner or later accompanies it.

Examination of the papillary layer of the cutis with a high power shows differences in the condition present according to

the relation of this structure to the papule. Outside of the region of Malpighian hyperplasia, there is nothing abnormal to be seen, unless that occasionally a blood-vessel appears to be slightly enlarged. This enlargement of the blood-vessels was rarely observed, and the conditions of the structure forming the papillary layer and the cutis in this region were generally normal as far as microscopical observation could tell. Within the region of the papule, however, changes are observed which differ in different papules and in different parts of the same papule. As a general rule there is great increase in the amount of structure lying between the Malpighian prolongations in the central part of the papule. If there is no normal adjoining tissue to compare with the morbid structure, one would suppose, as has been done by the authors I have quoted, that there is a great increase in the size of the papillæ; in fact, that there is a marked hypertrophy of the papillæ in this disease. If we call papillæ any cutis structure that lies between the Malpighian cells, regardless whether the latter is in a normal or in an abnormal condition, then one is justified in saying that the papillæ are greatly enlarged, as there is always an increase in psoriasis in the length, and often in the breadth of the space separating the Malpighian prolongations downward into the cutis over the size of the normal space.

Toward the margin of the papule, this inter-Malpighian space is less in extent in proportion as there is less hyperplasia of the Malpighian layer. The cause of this apparent increase in the size of the papillæ is readily understood by a study of Figs. 1, 2, 4, 6 and 8, by which it is easily seen that, to produce an increase in the size of the inter-Malpighian space, it is only necessary that the interpapillary part of the Malpighian layer; which is more or less cone-shaped, with the apex pointing to the cutis, be simply extended downward. That such is the nature of the process that takes place in the Malpighian layer; has I think been already shown, as I have pointed out that the papillæ do not grow upward to any appreciable extent, or approach the corneous layer nearer than they do in health. Although these interpapillary spaces are of greater length than the papillæ in the surrounding normal tissue, there

is not a corresponding increase in their diameter. Adjoining Malpighian prolongations downward approach each other more or less closely, and produce a corresponding decrease in the size of the upper part of the space separating them. See Figs. 1, 2, and 6.

The blood-vessels of the papillæ are more or less dilated in the different papillæ, and this dilatation is greatest in the centre of the papule and least at its margin. (I am still confining my description to a young papule of a few days' existence, and about the size of a pin's head.) In some papules this dilatation of the blood-vessels exists to a very slight extent, as far as can be judged from microscopical examination. In those cases in which I have found but very slight dilatation, there were also very few white blood-corpuscles outside the vessels in the neighboring tissue. In those papillæ where the blood-vessels are more dilated, there is always a greater or less number of out-wandered round cells to be seen. Such a condition is represented in Fig. 2. This drawing was made from a part of the papule situated about midway between the centre and the margin of the latter. There was a considerable number of round cells in the inter-Malpighian space, and but very few in the deep cutis. In the central part of this same papule a much greater number of out-wandered white blood-corpuscles were present in the inter-Malpighian space, and a considerable number also in the cutis beneath it, along the course of the blood-vessels. In the early stage of the disease the blood-vessels, though dilated, are not bent or curved, as generally occurs in the later stages. Along with this dilatation of the blood-vessels, and outwandering of the round cells, there is necessarily, to a greater or less extent, a transudation of serum into the adjoining tissue. These three things, viz., dilatation of the blood-vessels, transudation of serum, and the presence of white blood-corpuscles, make up the sum total of the pathological condition present in the papillæ during the early stage of the disease. The amount of hypertrophy of the papillæ produced by these three conditions is very small indeed, and is often more than counterbalanced by the encroachment upon them of the Malpighian layer by its hyperplasia. These three processes do not proceed, nor are they coeval with the com-

mencement of the hyperplasia of the Malpighian layer, otherwise they would have been present in the tissue between the two small closely-seated papules I have already mentioned, or at the margin of a single spreading papule.

In the deeper portions of the cutis, no change is observed in its structures in the earliest stage of the disease; and even in the centre of a papule of several days' duration, such as is represented in Fig. 2, there is nothing abnormal unless it is a slight dilatation of some of the blood-vessels.

We thus see that in the earliest stage of psoriasis there is no special hypertrophy of the papillæ, though the inter-Malpighian space is increased in extent. This increased space is not formed by hypertrophy of the structures forming the normal papillæ, but almost entirely of normal preëxisting cutis which has not changed its location or undergone any marked changes. The active changes take place in the Malpighian layer, and not in the inter-Malpighian spaces, there being nothing abnormal in the latter except the three processes mentioned above, and which necessarily do not produce much, if any, enlargement of the papillæ. As therefore the increase in the size of the inter-Malpighian space does not depend upon the production within the papillæ of new elements, as occurs in genuine hypertrophy of these structures, I do not think we are justified in calling the whole of the inter-Malpighian spaces in psoriasis, papillæ; and if not, then there is no special hypertrophy of this layer in the early stage of psoriasis, and, as we will see later on, also not in the other stages of the disease.

The hair in psoriasis becomes changed from the commencement of the disease. The external root-sheath; the structure corresponding to the Malpighian layer of the epidermis becomes increased in size in the same manner as the latter structure. There is a real hyperplasia, with an extension of the hyperplastic structure into the surrounding cutis. This growth occurs principally at the root of the hair, though it is met with also along the shaft. Fig. 5 represents a hair-follicle which was present in the papule from which Fig. 1 was drawn. Every hair situated within a psoriasis papule has this hyperplasia of its external root-sheath. This hair-follicle was so deeply seated that no hyperæmia whatever of

the blood-vessels surrounding it could be observed. That changes so great as are shown in this hair occur at so early a period of the disease, and unassociated with recognizable changes in the blood-vessels or tissue surrounding it, assists very much, it seems to me, in proving that the disease has its origin in the Malpighian layer.

Fig. 5.× 290.

The sebaceous glands and sweat-ducts show nothing abnormal.

The foregoing is the pathological histology of a psoriasis punctata of a few days' existence; and it seems to me that the only question that remains to be answered before we can speak definitely of the nature of the disease is whether this hyperplasia of the Malpighian layer is a result of a previous hyperæmia, or are the changes in the blood-vessels secondary to the hyperplastic process? When we consider that such hyperæmia as is present in scarlet fever, measles, and some other diseases, can, and generally does, completely disappear after death, it becomes a question whether something similar does not occur in psoriasis, and that, though no hyperæmia is recognized by the microscope external to the margins of the papule, yet it might have existed there during life, and was the cause of the hyperplasia; the increase of the normal production of the cells of the Malpighian layer being caused by the increased amount of nutriment carried by the blood-vessels to the papillary region. In the solution of this question I have spent much time, and could not for a long time arrive at any definite conclusion. I have been quoted as holding a certain view on this point nearly two years ago, but at that time, though I had examined a great many sections, I was still undecided as to its nature. Until then, I had only examined single papules, and from such examination it was impossible to state with positiveness the relation between the changes in the blood-vessels and those in the Malpighian layer, though it seemed almost certain that the hyperæmia

was secondary to the hyperplasia, for this reason, that in some papules there was but very slight dilatation of the blood-vessels of the papillæ, while in other papules of the same age there would be very great dilatation; and there seemed to be no special relation between the amount of dilatation and the amount of hyperplasia. This, together with the great changes observed in the external root-sheath of the hair within the follicle, at the earliest stage of the disease—changes unaccompanied, as far as microscopical examination could show, with changes in the blood-vessels surrounding the hair-follicle—left but little doubt in my mind as to the nature of the affection. The question seems to me, however, to be satisfactorily answered by the results of the examination, already described, of two papules seated near each other, but separated by apparently normal skin; at least no hyperæmia, or round cell infiltration, or œdema, was to be observed. As already mentioned, microscopic examination showed that the papules had almost, if not actually, joined each other in the Malpighian layer, though not above the level of the skin, i. e., a hyperplasia was occurring in a situation where no hyperæmia was appreciable to the naked eye, or could be detected by the microscope as having existed.

In all the other forms of eruption in psoriasis, we have only to do with differences of degree in the pathological process, the nature of the disease remaining the same as in psoriasis punctata. In psoriasis guttata, psoriasis nummularis, and psoriasis diffusa, the process has simply extended over a larger area of skin, and as a consequence; the process of hyperplasia being the essential process in the production of the increase in size, we can expect to find but little, if any, changes in the Malpighian layer in the later stages of the eruption different from those observed in the papular stage, except in the extent of the hyperplasia, and the consequent increased thickness of the rete Malpighii. As regards those secondary processes which showed marked differences in different papules in the early period of the eruption, they will naturally show differences in the other forms, and consequently there will be observed in different patches differences in the amount of dilatation of the blood-vessels, in the amount of œdema in the

surrounding tissue from transudation of serum, and in the number of emigrated white blood-corpuscles. In all cases in which the eruption remains as a psoriasis punctata, and does not increase in extent, no changes beyond those already described can take place, except such as are associated with the disappearance of the eruption. The nature of these changes will be given after the pathological histology of the other forms of the eruption has been described.

In Fig. 6 is given the appearance sometimes presented in an early stage of psoriasis guttata. This figure was drawn to show the great dilatation of the blood-vessels which is some-

Fig. 6.× 330.

Fig. 7.× 120.

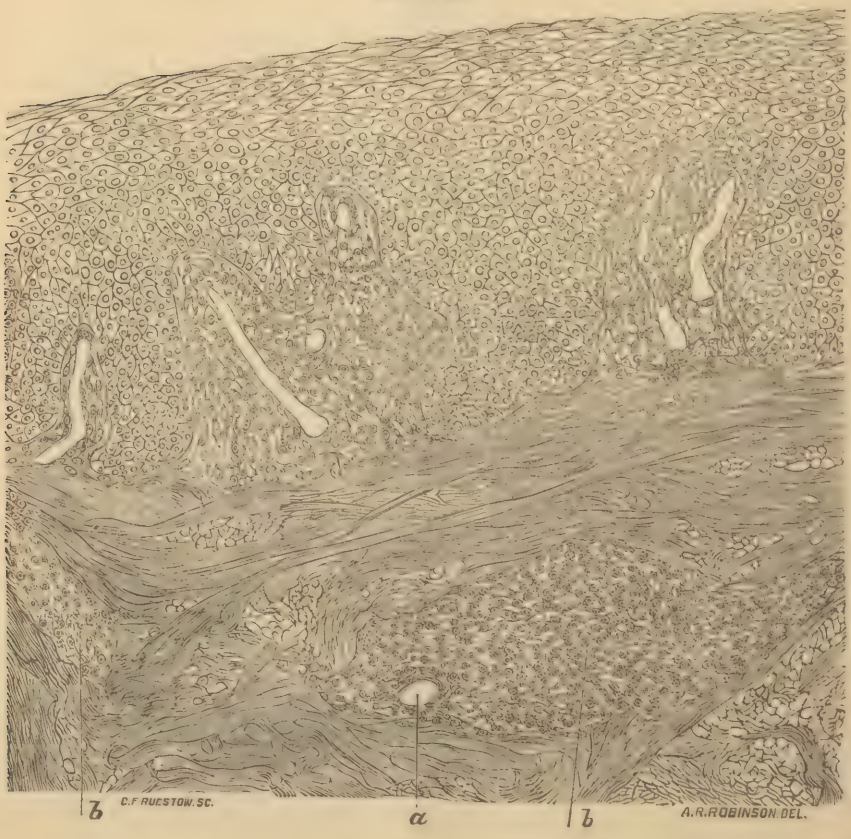
times present in psoriasis. None of the dried-up cells forming the whitish scales are shown in this figure, or in Figs. 7, 8, and 9, as they had become detached during the preparation of the section. As already mentioned, however, in the clinical history, the amount of whitish scales formed depends upon the activity, duration, and location of the eruption in each individual. The appearance presented by a perpendicular section through these scales is given in Fig. 10. The cells are dried up, bent, separated to a great extent from neighboring cells, and the interspaces are filled with air. In Fig. 6 the hyperplasia of the Malpighian layer is very great, and here again it can be observed that this hyperplasia has occurred almost exclusively in the interpapillary part of the Malpighian

layer. The prolongations inward are not conical in form, and the adjoining prolongations approach nearer each other below than above. The excessively-produced cells differ in no respect from those already described as constituting the hyperplasia in the earlier stage. The blood-vessels are enormously dilated, very much bent, curved within the papillæ, and distended with blood-corpuscles. In the patch of eruption from which this section was taken, in a great number of the papillæ the capillaries had become ruptured, and an extravasation of blood had taken place into the papillæ. This was the only case in which such great dilatation of the blood-vessels was seen, though it is probably present in a considerable number of those cases in which excessive bleeding follows scraping the patch. Scraping such a patch as that from which the section drawn in Fig. 6 was taken, would be followed by much more bleeding than ordinarily occurs in psoriasis after this operation. The slight amount of additional scraping, sometimes necessary to produce bleeding in this disease, after removal of the whitish scales, can be seen by referring to Fig. 7. In this case only two rows of cells separated the whitish scales from the papilla beneath. Outside the blood-vessels, in the patch represented by Fig. 6; in those inter-Malpighian spaces where no rupture of the blood-vessels and extravasation of their contents occurred, but few outwandered blood-corpuscles were to be seen, and none whatever were present in the deep cuts.

When psoriasis punctata has lasted a certain length of time and continues to increase in size, it becomes a psoriasis guttata, and afterward a psoriasis nummularis. The eruption in psoriasis guttata does not differ from that in psoriasis nummularis, except in the extent of skin affected, and that the older the eruption the greater generally is the amount of cell-infiltration in the papillæ and cutis. A section of a patch of psoriasis nummularis will, therefore, give the height of the changes which occur in any of the later forms of a psoriasis eruption, as regards the Malpighian layer, and, knowing already the changes which occur in psoriasis punctata, and remembering that the transition from psoriasis punctata to psoriasis nummularis is a gradual one, including, in its

march to become the latter, the form known as psoriasis guttata, and that the pathological condition in the latter form must therefore necessarily be simply an intermediate condition between the two other forms, I have considered it unnecessary to give a drawing of the changes which take place in this intermediate form, and have therefore represented in the next wood-cut, Fig. 8, the condition present

Fig. 8.× 300.



in a patch of psoriasis nummularis of a few weeks' standing, in which there was only an ordinary amount of cell-infiltration of the cutis present. The whitish scales are not drawn, having become separated from the rest of the section,

as already mentioned, during the preparation of the tissue. There was a large number of those scales present, as is generally the condition in this form of the eruption. In this figure is to be seen to what extent the hyperplasia of the Malpighian layer can occur in psoriasis. In the centre of the drawing is a Malpighian prolongation, cut probably almost through its centre. On each side of this large one are two small portions of similar prolongations. Still more externally are others which are cut much nearer the centre than the two near the central one. That the two small prolongations represent only sections from the upper margin of large prolongations was evident from the shape of the cells forming the cylindrical cells of the mucous layer. The large central prolongation is irregular in form, probably from the resistance offered by the underlying cutis to its extension downward. As in Fig. 2, the cells composing the lower part of the prolongations are smaller than those nearer the corneous layer. They arise, in my opinion, from the living matter composing the lowest layer of the rete Malpighii, and do not differ either in appearance, or arrangement, from the normal epithelial cells of this layer. The inter-Malpighian spaces contain, at this stage of the disease, a large number of emigrated white blood-corpuscles, some of which are more or less flattened from pressure of the connective-tissue fibres, but the majority of them are round. The accumulated emigrated cells, together with the accompanying transuded serum, separate the connective-tissue bundles and fibres from each other, and produce meshes of variable size in the connective tissue. They make in fact what could be called rarefied cutis tissue. In examining this tissue with a high power, it is found to consist of a meshwork, with the connective tissue forming the walls of the spaces. In the spaces themselves lie the emigrated round cells. Neumann regards this structure as newly-formed tissue, produced from the emigrated cells; but I cannot regard it in any other light than as a rarefied cutis tissue, containing white blood-corpuscles and serum. The complete removal of the two latter in the stage of disappearance by the lymphatics, leaving the part without any round cells,

seems to me, when taken in conjunction with the microscopical appearance, to be conclusive.

The blood-vessels in the inter-Malpighian spaces are all dilated, and their walls so changed that their limits are no longer easily recognized by microscopical examination. Sometimes the blood-vessels are much bent and twisted, and at other times they pass to the apex in almost as straight a line as, or even more direct than, in health. The reason so many round cells are present in the inter-Malpighian spaces is because this part is rich in blood-vessels, and the cell infiltration in psoriasis is confined to a small region around the blood-vessels. The reason the cells are arranged more or less perpendicularly in the whole of the inter-Malpighian space, except at the apex, where they lie more horizontally, is because their direction here, as in some other parts of the body, is influenced by the direction in which the connective-tissue fibres of the part run.

A superficial examination of the inter-Malpighian spaces in this drawing would lead one to believe that there is great hypertrophy of the papillæ present, and but little hyperplasia of the Malpighian layer. The cause of this apparently greatly enlarged space, on the left side of Fig. 8, is, as already stated, because the prolongation has been cut in this section near its base, whereas, had it been cut through its centre, it would have reached as far downward as the centre prolongation, and consequently, instead of a structure of connective tissue, round cells and enlarged blood-vessels, the space would have been principally occupied by a portion of the rete Malpighii. The same explanation is true of the right side of the figure. The real condition and explanation can only be known by remembering that the prolongations downward are more or less cone-shaped, with the apex pointing downward, and that in a section the knife can pass through any part of the cones, or even miss some of them entirely. This has almost occurred in the section drawn in Fig. 8. If the reader will bear this fact in mind, he will easily perceive that here, as in the early stage, there is no great hypertrophy of the papillæ.

The blood-vessels in the deeper layers of the cutis are dilated, and the surrounding tissue infiltrated with round

cells and serum. This cell infiltration does not become general throughout the cutis, but remains limited to the neighborhood of the blood-vessels. If the section given in Fig. 8 had included the course of the blood-vessels from the rete Malpighii to the deeper cutis, we would have found the tissue surrounding these blood-vessels filled with round cells. At *b* this perivascular infiltration is well marked. The blood-vessel at *a* is only a branch of the principal vessel which ran horizontally toward the right side of the figure, and was accompanied by the cell infiltration to be seen in that part. An adjoining section would show the blood-vessel. This cell infiltration produced a meshwork which is not well shown by the wood-cut, either here or in the inter-Malpighian spaces, as the engraver did not follow closely the original drawing.

The sebaceous and sweat glands are normal in this stage also.

The hair-follicles are affected in the same manner as in the early stage, only that the hyperplasia is more marked.

Such is the condition present in a patch of psoriasis of some duration, three or four weeks perhaps; and the condition during the period between the young papule and this stage is one of gradual transition from the one to the other, and need not be described further here than to state that, commencing from the condition known as psoriasis punctata, the rete cells continue to be excessively produced, and to spread farther inward, that the blood-vessels continue to dilate, and the surrounding cell infiltration and œdema to increase in the inter-Malpighian spaces, and to extend further and further along the blood-vessels into the deeper cutis, until the condition is arrived at shown in Fig. 8. The amount of blood-vessel dilatation and cell infiltration always varies in different cases, sometimes not being so great, or extending so deeply into the cutis, and at other times being much greater and more extensive than represented in Fig. 8. These varying conditions depend considerably upon the state of the patient's system and upon external influences which can affect the inflammatory processes of the disease.

After a time the disease frequently becomes chronic, the hyperplastic process less active, and fewer whitish scales are

formed upon the surface. The eruption spreads but very little, if any, and the patch is accompanied with more or less marked infiltration of the underlying cutis. In Fig. 9, I

FIG. 9.× 300.

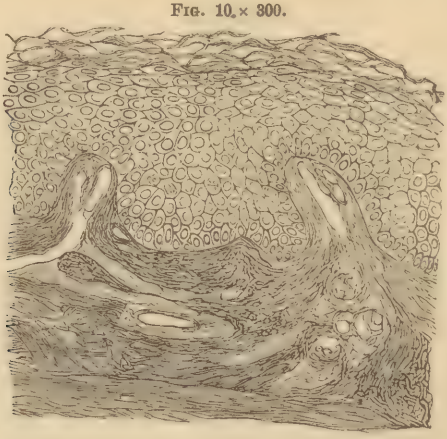
have drawn a section from such a patch. The hyperplasia of the Malpighian layer is easily recognized, as well as the absence of special hypertrophy of the papillæ. The same dilatation of the blood-vessels is present, and also similar perivascular accumulation of round cells and formation of the connective tissue into a meshwork. Wherever blood-vessels are present, there, and only there, does a connective-tissue infiltration occur.

In this patch, however, from the long duration of the process, the dilatation and cell infiltration have extended still deeper into the cutis than in Fig. 8. Fig. 9 is an excellent illustration of the condition of the skin in a chronic patch of psoriasis associated with an ordinary amount of infiltration. To the left of the section are seated a hair-follicle and sebaceous gland, the latter nearer the drawing, as can be seen by the cylindrical cells forming the margin of the figure. On this side of the figure are seen the blood-vessels which run perpendicularly alongside these structures, and the accompanying cell infiltration. It is to be noted that, apart from the immediate neighborhood of the blood-vessels, there is no cell infiltration into the connective tissue. This drawing can be studied with profit by those who believe in a close relation between psoriasis and eczema (compare a drawing of chronic eczema by Rindfleisch with Fig. 9, and note the difference). In no stage of uncomplicated psoriasis are emigrated round cells present in an abnormal quantity in the Malpighian layer. All my observations appear to me to show that psoriasis is not an inflammatory disease of the papillæ, or of the upper part of the corium.

During the period of disappearance of the disease there is a gradual return to the normal condition until the hyperplasia, dilatation of the blood-vessels, and cell infiltration have completely disappeared. The Malpighian prolongations become smaller and smaller until the layer attains its normal size; the blood-vessels gradually return to their normal diameter, and the round cells and serous exudation return to their normal channels. Of these pathological processes, the cell infiltration and œdema generally disappear first, and the hyperplasia last. Where previously the infiltrated cells were crowded together, and but little connective tissue was to be seen, the latter appears more and more to view, until, when all the cells have disappeared the tissue simply seems clearer, and the fibres further apart than in the normal state. In Fig. 10 is drawn a section from a psoriasis guttata patch, removed when the affected spot seemed to have almost returned to a normal condition, i. e., there was but slight elevation above the general surface, and only a few scales were present. Mi-

croscopical examination showed that the Malpighian layer had not returned to its normal size, and that the blood-vessels

Fig. 10.× 300.



were still dilated, though not a single round cell was to be found outside the latter. The infiltrated connective tissue had also not attained its normal density. The skin, which is the seat of a psoriasis patch, is not in a normal condition when all elevation above the general surface has disappeared, and no whitish scales are formed upon its surface, as at this stage all the results of the processes engaged in psoriasis, except perhaps one, viz., the cell infiltration, still exist to a certain degree.

In those cases in which the eruption is only a punctata, recovery is much more rapid, as there is not that dilatation of blood-vessels, or cell infiltration, which is present in the other forms of the disease. The continuance of the hyperplasia of the Malpighian layer after disappearance of all elevation of the patch above the general surface, as well as the presence of hyperplasia beyond the margin of a spreading patch (as between the two papules previously described) where no elevation is present, shows that the elevation of a patch of psoriasis depends not so much upon the hyperplasia of the Malpighian layer as upon the whitish scales, and upon the changes which occur in the papillæ and cutis, i. e., upon the hyperæmia, cell infiltration, and serum transudation.

In a portion of skin examined three weeks after disappearance of all elevation, when only a pigmentation of the skin remained to show that the spot had been the seat of an eruption, the Malpighian layer was found to have returned to its normal form, but the hair-follicles were still three or four times their normal size. The papillæ and cutis and blood-vessels were apparently normal. The cause of the pigmentation was the presence of an excessive amount of pigment in the normal structures for this substance. An occasional pigment granule was to be seen along the course of a blood-vessel, but they were not present in sufficient quantity to be appreciable to the naked eye. We thus learn that, even three weeks after apparent disappearance of the eruption, all the structures composing the skin are not again in a normal condition. The hyperplastic process, however, has probably ceased, though the results of the process have not disappeared, as it requires a lònger period for the excessively-produced cells to reach the surface, and be cast off from the body.

In one case where, instead of pigmented spots, white spots remained several weeks after disappearance of elevation and scaling, I found but little pigment in the rete cells, and an increase in the elastic fibres of the cutis. The blood-vessels were also interfered with, so that circulation had not been established when I excised the portion of skin.

It was my intention to discuss and protest against the view held by many dermatologists, that there is a close relation existing between psoriasis and ezcema, but the upholders of this view have been so completely answered lately by Dr. J. C. White, of Boston, that I will, at present, only say that the pathological histology of psoriasis, as given in this paper, clearly demonstrates that there is no histological relation between two diseases.

To discuss the question of the local or constitutional nature of psoriasis, I regard as only a waste of time, as the term constitutional, as at present used, has such an unlimited meaning. If, however, we restrict the term and give it the same meaning as general (as suggested by Dr. Moxon, and, as I think, properly), then psoriasis is a local disease, that is, it is a hyperplasia of the Malpighian layer of the skin, and, as has been

lately shown by Köbner and Wutzdorff, can be produced by local irritation, provided the tissue is predisposed to it. That the disease is generally inherited is not proof that it is a general disease of the system, since such local affections as malformations and fatty and cartilaginous tumors are also inherited. The disease is local at the commencement, always remains local, and never affects the general system. This subject might be discussed at great length, but, as I have already said, it is unnecessary. Pathologists in general recognize its local nature, but their view is not as yet accepted by all clinical observers.

All the drawings have been made by myself by means of a camera lucida, and can be relied upon as being nearly exact representations of the different sections.

In conclusion I have to express my thanks to Dr. M. H. Henry, Surgeon-in-chief to the State Emigrant Hospitals on Ward's Island, for a large amount of living material obtained from patients under his care; also to the artist C. F. Ruestow for his efforts to make the woodcuts resemble as nearly as possible the original drawings.

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